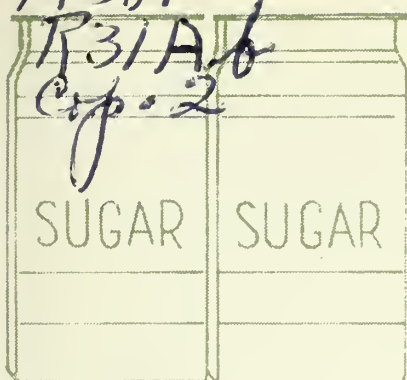


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**FROZEN
JELLED
FRUITS**



**FROZEN
JELLED
FRUITS**



The manufacture of jamlike jelled frozen spreads with uncooked fruits was an objective of processing research almost 20 years ago. Research published by the U. S. Department of Agriculture in 1947 solved problems of processing.

A major problem was combination of puree or juice, sugar, and pectin in a way to obtain a smooth spreadable product, without cooking. The early studies discovered appropriate levels of sugar and acidity and also devised ways to combine ingredients so that an attractive jell forms, which is stable when thawed after months of freezing.

Following those studies industrial manufacture of frozen jelled fruits developed to a moderate extent. Interest in commercial products has increased recently along with growth of the frozen food industry. Agriculture Experiment Stations and Extension Services in several State universities have developed directions for home preparation of this fine-flavored product. Directions for frozen uncooked jams are included in some consumer packages of pectin.

Requests for information have increased. This leaflet describes the product and reviews research and development related to frozen jelled fruits.

Products

Frozen jelled fruit spreads made from uncooked purees or juices have fresh-fruit flavors and bright natural colors. Their sugar content can be well under 60 percent or as high as that of cooked preserves (65 to 68 percent). Vitamin C (ascorbic acid) is retained at a high level -- over 90 percent for the berries and other fruits that were tested in the studies reported in 1947.

Fruits commonly used in preserves, jams, and jellies are suitable. For the most part the details of processing discussed below are suitable for all fruits. A few variations with personal preference are permissible.

When packaged for exclusion of air the jells keep well at 0°F. for at least a year. At lower temperature they keep longer. At increasingly higher temperature and with longer holding periods, tendencies toward granulation, syneresis ("leaking"), and loss of flavor increase.

Processing

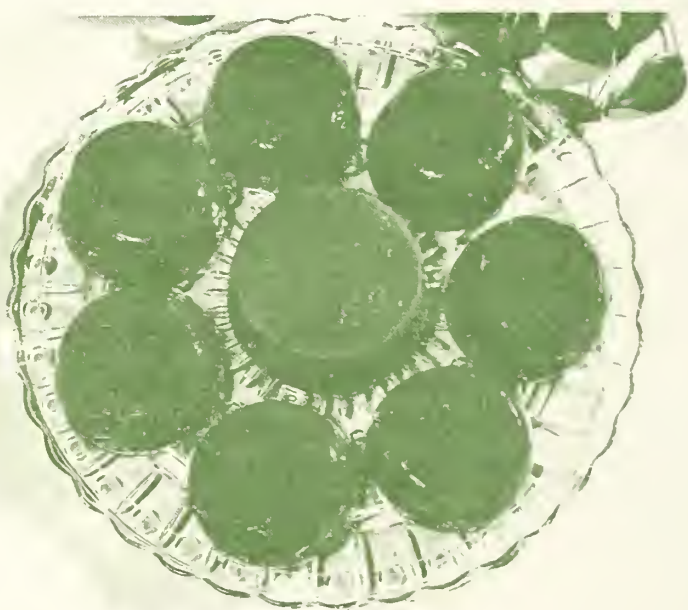
Two investigations were reported in 1947, one by Gestur Johnson and Mildred M. Boggs on use of various berries, currants, guava, and Santa Rosa plums in **Food Industries** (19:1491, Nov.) and one on cranberries by Boggs and Johnson in the same journal (19:1067, Aug.). U. S. Patent 2,459,431, "Cold Processed Fruit Spread," was granted to Gestur Johnson and Mildred M. Boggs on January 18, 1949. License to use the procedure is available on a royalty-free nonexclusive basis.

They reported the following conclusions: (1) that with 200-grade pectin, a level of about 0.45 percent of the weight of the final product was satisfactory; (2) that when acidity of the fruit was low (pH above 3.0) it was necessary to adjust to pH 3.0 ± 0.05 with jellymaker's standard fruit acid solution before blending with other ingredients; (3) that it was an advantage to begin by mixing the pectin with a small portion of the sugar-puree mix and then stir this mix into a larger portion (about 60 percent) of the puree; (4) that this mix could then be added to a mixture of the remaining puree and required sugar; and (5) that the product was best when the soluble solids (those in the fruit, added sugar, and pectin) constituted 56.5 to 57 percent of the total product.

Application of these techniques produced high-quality jells that solidified within a few hours at room temperature, prior to freezing. The research workers found that above 60 percent total soluble solids the sugar dissolved less readily and speed of jelling increased. Below 56 percent the efficiency of pectin declined. Levels of pH above 3.1 caused loss of jelling power with the pectins used.

Equipment and materials recommended in these early studies included a refractometer (sucrose scale) for measurement of soluble solids in the fruit, a pH meter, jelly maker's standard fruit acid, and conventional preserving containers with powered mixing equipment.

More recent developments, including the work of pectin manufacturers and that of the State Agricultural Experiment Stations, have simplified the process. Slight warming (up to 100°F.) can be used to induce dissolving of sugar. Pectin solutions can be added directly.



Frozen jelled fruits can be used in many ways.

One manufacturer of packaged jam and jelly pectin recommends sifting a 3.5-ounce package of his pectin into 4 cups of crushed fruit, mixing, and allowing the mixture to stand for 30 minutes with occasional stirring to dissolve the pectin. Then a cup of light corn sirup is mixed in, along with 5.5 level cups of sugar. The mixture is warmed to 100°F. to dissolve the sugar more quickly.



In another method a 1.25-ounce envelope of low-sugar pectin is dissolved in 8 fluid ounces of water and this liquid pectin is used in making frozen jelled fruit. The liquid is added to 1 lb. of fruit and a half pound each of light corn sirup and sugar. After the sugar is dissolved, 2 to 4 ounces of lemon juice (as may be needed for jelly formation) are added.

In still another method, reported by Washington State University, powdered pectin (3.5 ounces) is boiled in 8 fluid ounces of water for a minute. This pectin solution is mixed with 2 cups (1 pound) of mashed berries sweetened with 4 cups (2 pounds) of sugar. After thorough mixing the batch is packaged and allowed to stand at room temperature for one to two days until the jelly has set up and is then frozen.

Since the various methods for making the product differ widely, those interested in production have the opportunity to evaluate methods and products and select in accord with preference. Low-methoxyl pectins require less sugar than the jelly and jam pectins. The kind of pectin used thus affects the level of sugar in the product. Use of liquid pectin is convenient but it introduces dilution with water, which some may wish to avoid. The fact that it is easier to prepare fruit jells with liquid pectin may counteract the fact of dilution for many users.

Early industrial experience showed that sometimes white hard fondant-like masses of crystalline sugar (called sucrose hydrate) formed in the product. These are objectionable because in appearance they resemble mold. J. E. Brekke and W. F. Talburt of this Division reported studies in **Food Technology** in October 1950 (4:383) which showed that use of hermetic sealing and substitution of invert sugar for part of the total were effective ways to control this difficulty. Hermetic sealing is probably adequate. Most published recipes, however, recommend use of some noncrystalline sugar.

Industrial development

Frozen jelled fruits are products for which no standards of identity exist and ingredients must be listed on the label, including those of the pectin used. Pectin mixtures are now available which contain substances other than pectin. These are included to make sure that the jell will form under proper conditions and for other purposes.

Standards of identification for cooked preserves and jams are available from the U. S. Food and Drug Administration. These specify 65 to 68 percent of soluble solids in the composition. Makers of frozen jelled fruits accordingly are not permitted to use such names as **jams** and **preserves** for products that contain less sugar.

Manufacturers have met this problem by the use of various trade names. If further industrial development warrants the step, makers of frozen jelled fruits can apply to U. S. Food and Drug Administration for standards of identification. Use of a general name such as frozen jams, jellies, or preserves would facilitate marketing.

Those interested should obtain recipes and other information from the Agricultural Experiment Stations of State universities. The following may not be a complete list but it will serve as a beginning:

Colorado State University, Fort Collins

Oregon State University, Corvallis

Washington State University, Pullman

Purdue University, Lafayette, Indiana

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